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PERCEPTION OF DISTANCE

IN an interesting article in No. 20 of this JOURNAL, Dr. Holt has reviewed three recent papers of von Rohr, Koehler and Wandersleb, on the subject of a new instrument constructed by the famous firm of Carl Zeiss in Jena. The apparatus is designed to produce plastic views of any photographic picture in monocular vision, and is called the verant, as it produces the true natural impression of the photographed objects. Dr. Holt's review was based on the three papers, while no copy of the instrument itself had then crossed the ocean. For a few days, however, the verant itself has been in my hands, and as it is, so far, the only one in this country, it may be in order to give an account of my first observations, as the idea of a stereoscope for one eye must naturally awaken the interest of the psychologist. The three papers mentioned approach the problem, not with the interest of a psychologist, but with that of the photographer and optician.

The instrument fulfills that which is promised in the more conservative statements of those papers. My eyes are strongly myopic. I am accustomed to wearing strong eye-glasses which correct my short-sightedness entirely. The prescription for the instrument is that myopic eyes should use it together with their normal eye-glasses. If I do so, the effect is very satisfactory. If I take, for instance, a small landscape picture of 9×12 cm. in size, taken with a kodak camera in which the distance of the plate from the lens is 15 cm., and look at it, as most convenient for my eye with correcting glasses, at a distance of 30 cm., I have the impression of a flat picture. If I close one eye and put the verant lens before the open eye and look now at my kodak picture, I can not get a distinct image at all at a distance of 30 cm., but must bring it as near as 15 cm. to get a sharp view, and as soon as I do so, the picture at once suggests a plastic interpretation. Yes, it can not be denied that the solidity of the objects in the landscape appears somewhat more natural than the well-known view in stereoscopic pictures where the impression is too easily one of a little stage in which one piece of scenery is set,

without transition, behind the other. Everybody who inspects the photograph in this way seems to feel the same surprise; and yet I must confess that the only surprising fact to me is the discovery that this is new to all to whom I gave the instrument for inspection, and not least to those who are myopic like myself. We short-sighted persons can have exactly the same effect which the verant, together with biconcave eye-glasses, gives to our eyes as soon as we take off both the eye-glasses and the verant, and it seems almost inexplicable that every myopic person has not found this out for himself. For years I have been in the habit, if I want to enjoy a photograph, of taking off my eye-glasses, closing one eye, and bringing the photograph so near to the pupil that the angle under which I see the picture corresponds to the angle under which the view has been taken by the photographer. Not only the distant landscape, but every portrait assumes then at once a beautiful plasticity which far surpasses the effect of the stereoscope. The nearness of the object allows the restitution of the natural perspective, and all the motives of experience can thus cooperate to interpret the picture as the view of an object in three dimensions. As soon as the photograph is held at double the distance, the perspective is falsified, the plastic interpretation is inhibited, and this inhibition reaches, of course, its climax as soon as the photograph is looked at with both eyes, as the identical impression of both retinæ totally excludes a three-dimensional perception.

This inborn gift of the myopic eye is furnished by the verant to the normal eye, which is unable to see a picture as near as 15 cm. or less. The verant makes the eye short-sighted. It is a magnifying glass, which makes it easy for every normal eye to see a photograph at a distance of from 9 to 15 cm., and thus to reproduce, without any overstrain of accommodation, the angle of vision which belongs to the objects in nature. The lenses to be used have had to be calculated carefully. A much larger field of vision was needed than the usual magnifying glasses offer, and care had to be taken that the chief rays which pass through the magnifying glass should reach the fovea at every position of the eyeball when the eye is moving over the whole field. All this has been most successfully effected, as was to be expected of those optical masters whose recent improvements of microscope technique and whose new telestereometrical instruments deserve the highest credit. The large public, suffering from the defects of its virtues, deprived, that is, of the privilege of a natural magnifying glass on account of normal eyesight, will of course gladly make use of this system of lenses. But psychologically the apparatus does not offer anything new. If not

every myopic person, then at least every myopic psychologist must have enjoyed these experiences before.

The defenders of the verant have made, however, a further statement which seems to involve in a still higher degree the interest of the psychologist. Dr. von Rohr, for instance, says in his paper, reprinted from the *Photographic Journal:* "Summing up, we come to the following conclusions: supposing a verant lens of the focal length of the camera objective, a normal eye will obtain, through the verant, as far as perspective and accommodation are concerned, the same impression it would obtain from the natural landscape when brought to the place of the entrance pupil of the camera lens. And if color is neglected the impression caused by the photograph will exactly correspond with that exercised by the natural objects. This necessarily affects our apprehension of relief, and our estimation of distance must correspond with the conclusions we should derive from monocular inspection of the objects themselves." In the same way, the other authors take for granted that perspective, accommodation and color are the only factors which can possibly influence our monocular perception of distance, and that abstracting from color, and the strain of accommodation being excluded, a picture seen under the angle under which it has been photographed must give exactly the impression of real nature. That is, we must have the feeling not only that there is some relative depth in the parts of the photograph which we see a few centimeters from our eyes, but that we are looking into the real landscape seen from the standpoint of the camera's lens.

This effect would not only be psychologically interesting, but it would be also of practical importance. It is well known, for instance, that the very desirable introduction of the stereoscope into the schoolroom has so far suffered from the undeniable fact that the stereoscopic impression is not at all that of the real landscape but merely that of a very small plastic model of it, which gives after a short time the fatiguing feeling of dealing with small toys and not with reality. Now if the verant really succeeded, through giving the right perspective and by avoiding strained accommodation, in giving the impression of far distance, this practical difficulty would be solved. But it is in this point that I think that the promises are not conservative; that we have been made to expect more than the apparatus offers. The perspective is correct, accommodation is not involved, and yet I do not see anything but a picture which is a few centimeters from my eye and which for immediate perception is absolutely different from a view into the real landscape. It appears exactly as it appears to my myopic eye without any glass. There, too, the perspective is correct, and the lens adjusted to its normal

distance without accommodation, and yet there is no suggestion of reality, merely a suggestion of a small plastic model. Of course in the case of the verant, as in the case of the stereoscope, suggestible subjects can be easily brought to an affirmation of the question whether they see in the apparatus the same which they would see in real nature. The unusual and unexpected plastic character of the impression is then unwittingly substituted for the feeling of natural distance. But whoever is able to separate seeing in three dimensions from seeing in natural distance can not doubt that in both cases alike we reach the first end, the plastic interpretation, but are just as far removed from the other, the feeling of natural distance, as in the ordinary vision of pictures. The new instrument is thus in no way a real 'verant.'

The question arises, Why is that so? If I bring my landscape picture on a transparent glass plate into such a distance from my one eye that every point of this transparent photograph covers for my resting eye exactly the corresponding point of the real landscape and yet accommodation is excluded, as, for instance, in the case of the short-sighted eye, or in the case of the normal eye with the verant lenses, then we have exactly the retinal images of the real view of nature and the same repose of the lens. Why are we, nevertheless, absolutely unable to substitute the near object for the far one? This problem exists in spite of all the theoretical assurances that the one ought to appear exactly like the other, and I think that it is not impossible to furnish an answer to it.

If I am not mistaken, there is one point of difference between seeing the mere picture and seeing the far landscape, which has been neglected in the usual discussions. Every one knows, of course, that we see the picture and the landscape normally with the help of eye movements. The eye moves from point to point; but psychologists have neglected the consideration that the relation between eye movement and retinal image must be quite a different one for the landscape and for its photograph. Let us consider the simplest possible case, the case of the myopic eye without any lenses whatever, and without any need of accommodation for a picture as near to the eye as 10 cm. If I take a small landscape picture made with a camera whose distance from lens to plate is 10 cm., I have a splendid plastic view if I see it at a distance of about 10 cm. from my eye. I have before me just such a picture in which two mountain peaks are, in the photograph, 1 cm. distant from each other. If I now have my little picture at the distance of 10 cm. from the eye, these two mountain tops correspond in their distance of 1 cm. exactly to the retinal image which the two real mountains, which are ten miles away and one mile distant from each other, produce in my

retina. The retinal image of the two mountain peaks in the photograph is thus for my resting eye indeed identical with that of real nature. Does that mean that I have to make the same eye movement to go from the left to the right mountain in the landscape as in the picture? Of course, that would be so, the movement would be just as identical as the retinal images if the nodal point of the light rays were identical with the rotation point of the eyeball. But everybody knows that this is not at all the case. The light rays cross in the lens. The angle of vision, and thus the size of the retinal image, are thus dependent upon the distance of the lens from the retina. But the movement of the eye is related to a rotation-point which lies about 13 mm. behind the cornea, roughly speaking 1 cm. behind the nodal point of the rays. This additional centimeter plays, of course, no rôle whatever, if I look at my mountains in the real landscape; following with my eyeball from the fixation-point of the left mountain to the fixation-point of the right mountain, I make a movement whose angle can be declared identical with the angle under which I saw the two mountains with the resting eye in the first position. This angle of vision was determined by the distance of the nodal point, which was in our case ten miles, while the angle of eye movement was determined by the distance of the rotation-point, which would be ten miles plus one centimeter, and there is of course no possible difference for practical discrimination between these two distances.

But the situation is completely changed if I turn to my little picture 10 cm. distant from my eye. The angle under which I see my two peaks is, of course, again the same under which I saw them in the real landscape. It is determined by the distance of the picture from the nodal point, which is in this case 10 cm. But the angle of the eye movement necessary to fixate first the left and then the right peak is now a much smaller one because it is again determined by the distance from the rotation-point, and that is in this case 10 cm. plus 1 cm. With this short distance of the picture from the eye this one additional centimeter is not at all the negligible quantity which it was in addition to ten miles in the landscape. For the two real mountains the angle of the eye movement had a tangent of one tenth; for the photograph mountains, in spite of their equal size of retinal image, the angle of necessary movement would of course have a tangent of one eleventh. Roughly speaking, we could say that the photograph, in order to produce the same eye movement which the mountains in the landscape excited, would need a pictorial distance between the two photograph mountains of 11 mm. instead of 10 mm. Of course if the distance in the picture were made 11 mm. instead of 10, it would not cover any more the

mountains of the landscape. The retinal image would thus be relatively too large and would not give us any longer the true landscape. On the other hand, if we tried to correct it by bringing the picture one centimeter nearer to the eye, then of course every retinal image would be enlarged by that necessary tenth, and yet there would be no help for the situation, as now again the eye movement demanded by the retinal image would be relatively increased too.

We can put it in this way: *my real landscape demands a relation between retinal image and movement which my picture can not produce under any circumstances whatever.* That which would be needed to imitate the relations would be realized only if I had my retinal images from the picture at a distance of 10 cm., and at the same time the movements belonging to the same picture seen at a distance of 9 cm. That is of course unrealizable. We can not see a picture without having our movements constantly controlled by the size of the real retinal images, as it is necessary that the distance seen in indirect vision is the distance covered by the fixation-point during the eye movement. That demands, as we have seen, a different relation between retinal image and eye movement for near and far, and no verant and no stereoscope can eliminate this factor. If a 10-mm. object in the photograph demands an 11-mm. movement to give the impression of real natural distance, then we have a condition which can not be fulfilled.

If we remember how extremely delicate is our normal sensitiveness for retinal distances and how the newer studies in stereoscopic vision have demonstrated an unsuspected delicacy of adjustment between retinal images and motor responses, it is evident that this so far always neglected relation must be an extremely important one. If we have one adjustment of central reaction in which a certain eye movement corresponds to retinal images of one size, and another adjustment in which the same movements correspond to retinal images which are ten per cent. larger, we can really not expect our judgment of distance to neglect the difference between these two systems of relations. Of course they represent two extreme cases. Every distance beyond 10 cm. demands its special adjustment up to the point where the distance becomes too large to be influenced by the distance from the nodal point to the rotation-point. We must thus presuppose a sliding scale of ever new adjustments for the different distances at which we see any object, and we have, in this relation, probably not the least important factor in the judgment of the third dimension for relatively near objects, and probably even more important than the irradiation circles which control the accommodation, as these circles must be the same for objects which lie before and behind the fixation-point. Of course

the whole system of our localizing reactions becomes through these considerations more complex by far than the schematizations of the text-books propose. But physiological optics has shown at every point in its development that mere simplification has not always meant a deeper insight into the real relations.

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NOTE ON THE PHYSICAL WORLD-ORDER.[1] I

IT is a matter of common experience that we know something of the meaning of the term *body* and of the distribution of *bodies in space and time* before we are acquainted with those physical laws which, where they are known, enable us to describe bodies in new ways and to arrange them in that system which we call the physical world.

The task of discovering these laws, of effecting these descriptions, of constructing this system, belongs to a group of sciences, which, though differing *inter se,* we are accustomed to include under the single name of *physical science.* I say we are accustomed to refer to a single physical science; I mean we constantly hear such questions as these: What is the *physical basis* of life? How far are differences of civilization due to *physical,* how far to economic, etc., causes? These and similar questions lead us to contrast a science of physical causes with such sciences as biology, psychology and sociology. But just what sciences are included under the head of the physical, and on what ground they are included is by no means an easy matter to determine. Perhaps all would admit to this class the sciences of physics and chemistry; some, with Helmholtz, would include geometry; others, with the 'mechanists,' would include biology. But even if we confine ourselves to general physics and chemistry, there are still to be noted wide differences in method. Between mechanics, say, and chemistry, these differences are of sufficient importance to make the problem of finding a common nature in the two branches of science an extremely difficult one.

Nevertheless, I think we can frame a definition which, if applied to the sciences actually known, would bring into one class those which are usually included under the head of physical science, and explain the uncertainty in which we remain concerning others.

[1] This article was prepared at the request of Professor George S. Fullerton, who, with the author's permission, has appended it as a *Note* to his work 'A Treatise on Metaphysics' (*in press*). The thanks of the author are extended to Professor Fullerton and to his publisher, The Macmillan Co., for their courtesy in authorizing the publication of this *Note* in its present form.

I venture to say, then, that *a physical science is one which employs in its description of nature only such terms as can adequately be defined by the use of the measuring rod.*

What is here meant by the *description of nature* offered by a science will best be understood if we consider a typical scientific problem: Given a group of bodies, in which are to be found certain conditions, such as position, volume, mass, temperature, etc., what changes of condition are these bodies going to undergo? To answer this question we should have to be in possession of a law which connects these conditions with one another and with time. The *description of nature* offered by a science is nothing other than the law or series of laws which it has formulated.

Now, our definition asserts that such a law is a physical law, if to understand its meaning and to verify its truth no knowledge is presupposed other than such as is involved in the use of the measuring rod. In examining the application of this definition to known sciences, its import will be seen more clearly.

The use of the measuring rod, *i. e.,* the description of the procedure by which we may determine the ratio of two lengths, is established in certain of the axioms of geometry. All the axioms are not devoted to this description; some explain the way in which, knowing how to determine the ratio of two lengths, we may determine the relative magnitudes of two angles. We may say, therefore, that all that portion of geometry which is not a definition of measurement, but which records the results of measurement, falls under our definition of a physical science.

Next, let us turn to the science of mechanics, and by way of fixing our thoughts we may consider a particular law of mechanics, say, the law of gravitation. This law is of such a nature that in order to apply it to a group of bodies we are obliged to know the mass of each body, its position, and the velocity with which it is moving. Applying the law, we can calculate the values which these conditions will assume at any moment. Now, of the terms used in this description, the positions of the bodies would evidently be determined by the use of the measuring rod in conformity with the principles of geometry; but when we describe the motion of bodies we are obliged to introduce such terms as velocity and acceleration. These terms stand for quantities and are susceptible of measurement, but in determining their values it is not sufficient to measure space magnitudes; we are obliged also to measure periods of *time.* It may not at once be apparent in what sense time can be determined by the use of the measuring rod; yet the physicist defines time as the hour-angle of a certain star, and this angle is, in the last resort, determined by measurements of length. Time, therefore, and con-

sequently such ratios of space and time as velocity and acceleration, are determined by the use of the measuring rod.

Finally, in our mechanical example we have had to make use of the term *mass*. This once more appears in our law as a quantity susceptible of measurement; but in what sense can this measurement be effected by the use of the measuring rod? The mass of a body is not determined by its geometrical form or by its volume, for two bodies of exactly the same form or of the same volume may have different masses ascribed to them; and to suppose with Democritus that bodies are made up of atoms which themselves differ in mass only as they differ in volume, would carry us beyond the limits of scientific experience. It is not necessary to introduce any venturesome hypothesis in order to understand in what sense the physicist's determination of the mass of a body depends solely upon measurements of length. Indeed, in the simplest instrument for determining mass, *viz.*, the balance, it is at once evident that no observations are made except observations of position. This, to be sure, is a determination of mass under particular conditions; but it can easily be shown that the most general definition of mass which the physicist can frame is stated in terms of positions and motions involving only such quantities as can be determined by the use of the measuring rod.[2]

It is clear, then, that if the science of mechanics were nothing but an application of the law of gravitation, it would fall within the class of physical sciences as here defined. Now, although the science of mechanics may include other laws than that of gravitation, these other laws must yet resemble the law of gravitation in that the only terms which they employ are ultimately definable in terms of mass, length and time. What has been said, therefore, of these terms as they occur in the law of gravitation, might be said of them with equal truth as they occur in any other law of mechanics. So that we may conclude that the science of mechanics employs in its description of nature only such terms as may be understood by the use of the measuring rod, and that consequently it falls within our definition of a physical science.

The other sciences that are ordinarily recognized as physical build on the mechanical basis, *i. e.*, the new terms which they introduce into their description of nature involve in their definition the three whose meaning has been fixed by mechanics. A complete description of these new terms would lie outside the plan of the present paper. We may, however, indicate the lines which such a discussion would follow, by considering the sense in which the *units* introduced

[2] *Vide* Mach, 'Mechanics in its Development,' ed. 2, p. 243.

into general physics are in the end determined by the use of the measuring rod.

Thus, a *unit quantity of heat* is the quantity required to raise a unit mass of water one degree centigrade. The term 'mass' we have already considered: it need hardly be pointed out that the ordinary measure of temperature—the expansion of a mercury column—is a linear one, while a degree of absolute temperature is defined by Thompson in terms of mechanical work. Again, *a unit quantity of electricity* is the quantity which acts on a similar quantity with unit force at unit distance. Now a unit force is one which would impart to unit mass a unit acceleration. The measure is therefore based upon mechanics, and the instrument actually used in the measurement, say Coulomb's tortion balance, is read in degrees of arc. As a last example, a *unit atomic mass*, though difficult to define, involves no measurements save those which determine mass and volume.

These units which enter into the different physical sciences reveal in a characteristic way the nature of the sciences. It is only when we are in possession of the fundamental laws of a science that we can define the meaning of such units. This discussion of them will suggest the way in which a complete examination of the physical sciences with respect to their definition would have to be made. I shall take it to be sufficiently established for our purpose that physical sciences describe nature in terms whose meaning depends wholly on the use of the measuring rod. So defined, we see that they would include the known sciences of mechanics, general physics, and chemistry; but what sciences, if any, would such a definition exclude?

Suppose one were asked: What is the future of republican institutions? or, What is the cause of the decay of the drama? Would a reasonable person be likely to arm himself with a foot-rule with which to discover the answers to these questions? And yet such questions have a meaning. The demand of the one for prediction and of the other for explanation is a scientific demand, and a scientific effort can be made to meet it. Only it seems scarcely sensible to ask one to put these problems in such wise that a measuring rod would play any part in the solving of them.

Take another question: Why did the picture of a summer day in another land come into my mind just now as I looked out upon a bleak landscape? I search among my ideas for *links of association.* The law of association with which I am for the moment satisfied can apparently not be expressed in terms reducible to space measurements. Even the observation of living organisms whose simpler forms behave in a way that we are more and more inclined to regard as determined by physical and chemical laws, gives rise to terms and laws that seem to have no reference to the foot-rule. *Habit,*

inheritance, variation, natural selection,—these terms mean something, they describe conditions we can recognize; the laws have a significance, on the basis of given conditions they serve us in prediction and explanation. We are evidently dealing with a science, but with one which appears to fall without our definition of a physical science.

It would seem, then, that there might be sciences pursuing methods other than physical—at least there is a reason for thinking so sufficient to have given rise to interesting problems concerning the possible limits of the physical image of nature. For example, the question has often arisen in the history of reflective thought: To what extent have we a right to expect that for every definable natural phenomenon a physical explanation may be found? We may illustrate the meaning of the question, as well as indicate its answer, by a particular example.

We said that physical science devotes itself to the study of objects in space and time, so far as their behavior is ultimately describable in terms of the measuring rod. Among the bodies whose behavior is thus describable are the bodies of our fellow men and our own. The body of my neighbor yonder would fall from a height to the earth with the same acceleration as would a stone. The physics and chemistry of the process of nutrition, secretion, etc., going on in his body are becoming better known. Even that portion of its activity which we are accustomed to regard as deliberate, and which sufficiently distinguishes his body as animate and conscious, may still resemble the behavior of an inanimate machine in its obedience to such laws as that of the conservation of energy. Have we not, therefore, every reason to suppose that, with advancing science, that particular natural phenomenon,—the behavior of a given human being,—will receive a physical explanation?

No sooner, however, do we conceive a hope of receiving a physical answer to the kind of question respecting our neighbor's behavior that we have instanced, than it occurs to us that there are many questions respecting such behavior to which we would not expect a physical answer. The beautiful old illustration that Plato gives in the Phædo will serve us here. Socrates, it will be remembered, was sitting in prison awaiting his execution. The painful interval remaining was to be whiled away in pleasant discourse with his disciples on the immortality of the soul. In the course of the discussion Socrates is led to consider in what different ways things may be explained. He recalls the enthusiasm with which he first learned that Anaxagoras, instead of resting satisfied with the old order of mechanical causes, had sought to show how 'mind was the disposer and cause of all.' But he was quickly undeceived:—

"What hopes I had formed, and how grievously was I disappointed! As I proceeded, I found my philosopher altogether forsaking mind or any other principle of order, but having recourse to air, and ether, and water, and other eccentricities. I might compare him to a person who began by maintaining generally that mind is the cause of the actions of Socrates, but who, when he endeavored to explain the causes of my several actions in detail, went on to show that I sit here because my body is made up of bones and muscles; and the bones, as he would say, are hard and have ligaments which divide them, and the muscles are elastic, and they cover the bones, which have also a covering or environment of flesh and skin which contains them; and as the bones are lifted at their joints by the contraction or relaxation of the muscles, I am able to bend my limbs, and this is why I am sitting here in a curved posture; that is what he would say, and he would have a similar explanation of my talking to you, which he would attribute to sound, and air, and hearing, and he would assign ten thousand other causes of the same sort, forgetting to mention the true cause, which is, that the Athenians have thought fit to condemn me, and accordingly I have thought it better and more right to remain here and undergo my sentence; for I am inclined to think that these muscles and bones of mine would have gone off to Megara or Bœotia—by the dog of Egypt they would—if they had been guided only by their own idea of what was best, and if I had not chosen as the better and nobler part, instead of playing truant and running away, to undergo any punishment which the state inflicts. There is surely a strange confusion of causes and conditions in all this. It may be said, indeed, that without bones and muscles, and the other parts of the body, I can not execute my purposes. But to say that I do as I do because of them, and that this is the way in which mind acts, and not from the choice of the best, is a very careless and idle mode of speaking. I wonder that they can not distinguish the cause from the condition, which the many, feeling about in the dark, are always mistaking and misnaming."

There is here a physical situation which Plato roughly outlines, but to have this situation pointed out to us in reply to our question, Why, Socrates, are you sitting here? strikes us as droll. Besides the physical questions respecting Socrates' behavior and the physical answers which in the course of time we may hope these questions will receive, there would seem to be other questions which are not physical, and to which we can neither hope for, desire, nor conceive a physical answer.

To reconcile these two points of view an assumption has sometimes been made which will illustrate very well one sense in which physical

science has been supposed to be of limited application to nature. The assumption is,—and we may suppose Descartes to make it,—that in spite of the fact that most of the behavior of a human body is capable of explanation in terms of physical science, yet not all of its behavior is so. Even if we were in possession of the most complete physical knowledge, a part of that behavior would remain unpredictable on physical grounds. This part is not, perhaps, inexplicable, but if we try to explain it, it must be in terms which have no physical meaning, *e. g.*, in terms of *motives*. In our example it was the suggestion of a physical explanation for this part of Socrates' behavior which furnished the comic element in Plato's sketch.

This way of looking at the matter would seem to be intelligible, at least. We find a ship propelled by a physically describable machine, but to explain its whole behavior we should have to take into account the helmsman, who is no part of that machine. The human body is analogous. It is a machine directed by a soul, which is no part of that machine. The part of this conception which demands our immediate attention is not the introduction of the soul, but the hypothesis of an incomplete physical machine. We are not concerned with the adequacy of the non-physical filling, but with the assumption of the physical gap. The assumption is, that part of the behavior of an object in space and time can not be explained in physical terms.

With regard to this hypothesis I need not ask, Is it true? but rather, Is it intelligible? Does it really mean anything? In the first place, it will be noted that the hypothesis in question is not an attempt to point out our actual inability to give a physical explanation of a certain phenomenon. This inability every one would admit. The point of the whole hypothesis is that the phenomenon is assumed to be essentially inexplicable in physical terms. What, we ask, does *essentially inexplicable* mean in this connection?

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DISCUSSION

OF 'TIME PERCEPTION'

I

DR. MONTAGUE'S theory of time perception, and the discussion it has called forth, have been most interesting and instructive.

I find myself especially sympathetic with Dr. Montague's general view of consciousness, and therefore feel the more hesitancy in

criticising his position in relation to the subject he treats. Nevertheless, it seems to me clear that his theory, as thus far presented, shows a very important weakness in the fact that, while it takes account of pastness and of specious presentness, it takes no account of futureness.

Now it seems to me that the appreciation of futureness is of equal moment with the appreciation of pastness, and I can not but feel that a theory which relates to our appreciation of *timeness* in any way must be inconclusive—yes, open to grave objection—unless it deals with futureness as well as specious presentness and pastness; and unless it is able to show the relation between the three phases of the time quality. Psychologists will look with much interest for a further elucidation of Dr. Montague's views which will make his theory more complete in the directions above noted.

II

Dr. Montague's theory is based upon our attempt to answer the question, 'How is it that at any one moment there can appear to be present several moments?' Now here I must confess that, under the view as to the nature of consciousness which I have been presenting in late numbers of this JOURNAL, this question does not seem to me to be one which involves very serious difficulty.

Consciousness in any moment, in any '*Now*,' appears as a complex 'noetic pattern,' part of which—what we call the field of attention—is emphatic.

This field of attention is, however, always complex; the main emphasis of the noetic pattern is always pervaded by a number of more or less distinguishable minor emphases.

Now each emphasis in consciousness, as given in reflection, displays some phase of the time quality; it must be qualified either by pastness, or by specious presentness, or by futureness; although in many cases this *timeness* qualification may not be sufficiently prominent to call for remark. When the field of attention is definitely complex, when the main emphasis of the noetic pattern displays within it distinguishable minor emphases, each of these minor emphases must also display either pastness, or specious presentness, or futureness.

This is quite comparable with the fact that each of these minor emphases must display specific grades of the other general qualities. For instance, each of these minor emphases must display some measure of intensity, some measure of stability or realness, some measure either of pleasure or of pain.

It does not seem to me to be remarkable, therefore, that we should grasp in any one 'now' a number of minor emphases in which are

noted diverse grades of the diverse phases of timeness—some of these emphases seeming to have more or less of pastness, and, I may add, others seeming to have more or less of futureness; those emphases in which neither pastness nor presentness is displayed being described as distinguished by specious presentness.

III

The real problem, then, seems to me to lie deeper down, as it were, and may be stated by asking why some of these minor emphases within a total emphasis display more or less of pastness, why some display more or less of futureness, why some display specious presentness.

I shall not pretend to have reached any settled conviction on this point, but it seems to me that this is an opportune moment to call attention to a possible direction of inquiry which may lead to a solution of this problem.

If we consider the neururgic patterns, which correspond with the noetic patterns of which we have thus far been speaking, we note that each of the minor noetic emphases above spoken of must correspond with given minor neururgic emphases. These neururgic emphases are due directly or indirectly to the reception of stimuli received from the environment; and, as we men are exceedingly active, in an ever-changing environment each neururgic emphasis must ever be changing in complexity. And it is evident that each neururgic emphasis must display one of three phases, either a developing complexity, or else a simplifying complexity, or else a condition of unchanging complexity; which last must, in general, appear as a transition form.

Evidently also these diverse characteristics of neururgic emphases will be brought into most prominence when we are directly affected by other objects in the environment.

When objects are approaching us, the neururgic emphasis produced by their effect upon us will markedly display developing complexity. When objects are departing from us, the related neururgic emphasis will markedly display a simplifying complexity. When objects are stationary with reference to us the related neururgic emphasis will display an unchanging degree of complexity.

It would appear thus that each neururgic emphasis, when considered from a certain aspect, must display always one phase of a three-phased quality. It must display either an increasing complexity, which will be most prominent when we are affected by objects approaching us; or a decreasing complexity, which will be most prominent when we are affected by objects departing from us;

or an unchanging complexity, which will be prominent when the objects affecting us are stationary in relation to us.

Now, if there is any truth in the theory of a thoroughgoing noetic and neururgic correspondence, we should expect to discover in consciousness a general three-phased qualification of our noetic emphases corresponding with the three-phased qualification of our neururgic emphases just described. Beyond that, we should expect these phases to be most distinctly marked in connection with the mental states occasioned by objects respectively coming to us, going from us, or stationary with reference to us. And if, as is our habit, we happen to use spatial terms in speaking of our experience in this respect, we should expect to find ourselves describing this three-phased mental quality in terms of relation to the movement of objects in the outer world.

Here, then, we are led to ask whether we have the experience of such a three-phased general mental quality, and one which we thus describe in spatial terms. We are at once ready to agree that we have such a quality in the time quality.

The futureness of a noetic emphasis is usually described by speaking of the future as coming to us.

The pastness of a noetic emphasis is usually described by speaking of the past as going from us.

The presentness of a noetic emphasis is usually described as the present which is with us.

This would indicate that the time quality is a special 'feeling of relation,' due to the conditions of complexity, or to relations directly variable with the conditions of complexity, within the noetic emphasis to which the pastness, or the specious presentness, or the futureness is attached.

IV

All that I have said above relates to the question, what in any specific noetic emphasis is the basis of the appreciation of a special phase of timeness, whether pastness, or specious presentness, or futureness? But, evidently, if this is due to the appreciation of changes of complexity, in the cases of pastness and futureness there is a more fundamental question to be answered; for when we appreciate change of complexity we must, under our view, experience a noetic pattern of multiple emphasis in which must appear at least three minor emphases, a and a' and that minor emphasis which we describe by saying a was before a'. Whether the specific minor emphases display pastness or futureness, therefore, we have in each case this same appreciation of 'one after another,' and that itself involves the appreciation of the time quality.

It would seem, thus, that the noetic qualification which involves the placing of a given emphasis in time, in the past or in the specious present or in the future, must be, as it were, laid over upon a more fundamental noetic qualification which involves the appreciation of timeness in itself.

We, as psychologists, have here, then, to consider this more fundamental time problem which must have relation to all forms of noetic emphasis. It appears to me that we find its solution in terms of neururgic and noetic assimilation; and here I am glad to feel that, if I understand Dr. Montague, there is a close harmony between the general positions taken by him and the view I shall now present.

V

If we could assume a neururgic condition in which all of the elements of the nervous system were equally active, the neururgic surface, so to speak, would appear as a plane upon which no appreciable neururgic pattern would appear. The nearest approach to such a neururgic condition in our experience is the condition of deep sleep. Now let us suppose ourselves aroused to a fully awake state by the stimulations due to a flash of lightning and a simultaneous crash of thunder. Then a complex neururgic pattern would at once develop which may be symbolized with artificial simplicity as $\overset{a}{S}^{1.\,2.\,3.\,4.\,5}$. But the hypernormal activities in the special neural elements represented by the above symbol would at once spread their influence within the whole neururgic system, the activity of which as a whole would be increased in some measure; and this would lead to a gradual disappearance of certain minor emphases, which would no longer appear as such if the degree of activity of the whole mass of the neururgic system were increased.

Consequently, if in the two moments following the flash and thunder we assume no other source of stimulation, the neururgic pattern would display forms which may be symbolized in (2) and (3) below. The large S of moment (1) is displaced by the small s in moments (2) and (3), in order to indicate the fact that the parts of the nervous system in immediate contact with the environment—the sensory organs—are no longer hypernormally active.

The neururgic emphases of the three moments would then be symbolized as follows:

(1) $\overset{a}{S}^{1.\,2.\,3.\,4.\,5}$.

(2) $\overset{a}{s}^{1.\,2.\,3.\,4}$.

(3) $\overset{a}{s}^{1.\,2.\,3}$.

If in moments (2) and (3) new forms of stimulation reach us, as is almost invariably the case in our experience, we may symbolize the new form of moment (2) by $\overset{\beta}{S}$, and that of moment (3) by $\overset{\gamma}{S}$. Consequently we may symbolize the neururgic conditions of these three moments as usually given as follows:

(1) $\overset{\alpha}{S}^{1.2.3.4.5.}$

(2) $\overset{\beta}{S}^{1.2.3.4.5.}$; $\overset{\alpha}{s}^{1.2.3.4.}$

(3) $\overset{\gamma}{S}^{1.2.3.4.5.}$; $\overset{\beta}{s}^{1.2.3.4.}$; $\overset{\alpha}{s}^{1.2.3.}$

We thus symbolize the simplest possible form of the neururgic pattern in any moment; and it would appear that, if this symbolization is correct, the same fundamental form must be displayed in all more complex, and more usual, forms of the neururgic pattern.

Here, in (3) above, we have, then, a typical neururgic form; and it is one which displays multiple emphases *and a simplifying complexity.*

The corresponding typical forms of neotic patterns may be symbolized as follows:

(1) $\overset{\alpha}{P}^{1.2.3.4.5.}$

(2) $\overset{\beta}{P}^{1.2.3.4.5.}$; $\overset{\alpha}{p}^{1.2.3.4.}$

(3) $\overset{\gamma}{P}^{1.2.3.4.5.}$; $\overset{\beta}{p}^{1.2.3.4.}$; $\overset{\alpha}{p}^{1.2.3.}$

Here the large P is used to indicate emphases in which sensational elements are usually prominent; *i. e.,* what are usually called presentations, but what I prefer to call primary presentations. The small p is used to indicate emphases in which these sensational elements are lacking, or lacking in any prominence; *i. e.,* what are usually spoken of as images, or representations, but what I prefer to call secondary presentations.

In (3) above we have then a typical noetic form; and it is one which displays multiple emphases *and a simplifying complexity.*

Now if this is a proper symbolization, and if the above given hypothesis as to the basis of temporal appreciation is correct, then every neotic emphasis—every presentation in attention—should be appreciated as involving the *timeness* qualification due to a simplifying complexity, and which, when it becomes very marked, we describe, as we have seen, as pastness. That is, in each moment each emphasis in consciousness, when considered in relation to this *timeness* qualification in itself, should be appreciated as slipping away from us into the past; and consciousness in this aspect might well be de-

scribed in spatial terms as a stream flowing from us. That we do appreciate the field of attention as in general of this form I think is clear; and that we do thus describe it as a stream none will deny.

We have thus a general form of noetic emphases involving temporal appreciation, and this must hold whether we appreciate an emphasis as in the specious present, or as especially qualified by pastness, or as especially qualified by futureness.

It would appear, then, that the qualifications which lead us to the distinct placing of an emphasis in the past or in the future, must be due to forms which are, as it were, overlaid upon this typical form.

Now I take it that when the form of the noetic pattern of three successive moments is symbolized as above,

$$(1a)\quad \overset{\alpha}{P}{}^{1.\,2.\,3.\,4.\,5}.$$

$$(2a)\quad \overset{\beta}{P}{}^{1.\,2.\,3.\,4.\,5};\ \overset{\alpha}{p}{}^{1.\,2.\,3.\,4}.$$

$$(3a)\quad \overset{\gamma}{P}{}^{1.\,2.\,3.\,4.\,5};\ \overset{\beta}{p}{}^{1.\,2.\,3.\,4};\ \overset{\alpha}{p}{}^{1.\,2.\,3},$$

then in (3*a*) we appreciate specious presentness, which in itself has the *timeness* qualification pure and simple, and is describable as a section of a stream flowing from us.

But when the form of the noetic pattern of three successive moments may be symbolized thus (the primary presentations showing a simplification of complexity),

$$(1b)\quad \overset{\alpha}{P}{}^{1.\,2.\,3.\,4.\,5}.$$

$$(2b)\quad \overset{\beta}{P}{}^{1.\,2.\,3};\ \overset{\alpha}{p}{}^{1.\,2.\,3.\,4}.$$

$$(3b)\quad \overset{\gamma}{P}{}^{1};\ \overset{\beta}{p}{}^{1.\,2};\ \overset{\alpha}{p}{}^{1.\,2.\,3},$$

then in (3*b*), over and above the simplification of complexity which is common to all noetic emphases, there appears a form in which a simplification of complexity[1] becomes very marked, and then we appreciate a definite sense of pastness as existing in connection with the whole noetic emphases (3*b*).

On the other hand, when the form of the noetic pattern of three successive moments may be symbolized thus (the primary presentations showing a developing complexity),

[1] The fact that in this symbolization the simplification appears in inverted form in (3*b*) is of no significance, inasmuch as each of the minor emphases $\overset{\gamma}{P}{}^{1}$; and $\overset{\beta}{p}{}^{1.\,2}$; and $\overset{\alpha}{p}{}^{1.\,2.\,3}$ (and the same is true in all similar cases) is appreciated in one and the same moment, as inherent in one more complex emphasis.

$$(1c)\quad \overset{\alpha}{P}{}^{1.2.3.4.5}.$$

$$(2c)\quad \overset{\beta}{P}{}^{1.2.3.4.5.6.7};\ \overset{\alpha}{p}{}^{1.2.3.4}.$$

$$(3c)\quad \overset{\gamma}{P}{}^{1.2.3.4.5.6.7.8.9};\ \overset{\beta}{p}{}^{1.2.3.4.5.6};\ \overset{\alpha}{p}{}^{1.2.3},$$

then in (3*c*), over and above the simplification of complexity which is common to all noetic emphases, there appears a developing complexity of marked type, and then we appreciate a definite sense of futureness as existing in connection with the whole noetic emphasis (3*c*).

When in any one moment there appear to be present several moments, and one of these appears to be qualified by pastness, one by specious presentness, one by futureness; then in one moment the total emphasis is a complex of three minor emphases of a first grade, (3*a*), (3*b*) and (3*c*); and each of these minor emphases of the first grade shows minor emphases of a second grade; so that the highly complex emphasis of the moment may be symbolized thus:

(3*b*) Pastness. (3*a*) Presentness.

$$[\overset{\gamma}{P}{}^{1};\ \overset{\beta}{p}{}^{1.2};\ \overset{\alpha}{p}{}^{1.2.3}];\quad [\overset{\alpha}{P}{}^{1.2.3.4.5};\ \overset{\beta}{p}{}^{1.2.3.4};\ \overset{\alpha}{p}{}^{1.2.3}];$$

(3*c*) Futureness.

$$[\overset{\gamma}{P}{}^{1.2.3.4.5.6.7.8.9};\ \overset{\beta}{p}{}^{1.2.3.4.5.6};\ \overset{\alpha}{p}{}^{1.2.3}.]$$

What the value of these suggestions may be I am probably not well able to judge. I present this hypothesis thus for the first time, although it was thought out a number of years ago, and during the intervening years has been constantly borne in mind, and has been found in harmony with the facts of our conscious life so far as they appear to my own introspection.

As I have said above, this seems to me to be an opportune moment to present it to my fellows for criticism and suggestion.

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REVIEWS AND ABSTRACTS OF LITERATURE

Hobbes. SIR LESLIE STEPHEN. English Men of Letters Series. New York, The Macmillan Co., 1904. Pp. v + 243.

The following note by F. W. Maitland appears at the end of this study of Hobbes: "During the last months of his life Sir Leslie Stephen was writing this book. When he could no longer work he asked me to see it through the press. Its readers should, I think, be told that he had some thoughts of adding to it a few sentences about the influence exercised by Hobbes on later philosophers, the French Encyclopædists and the English Utilitarians, and that he gave me some notes, by the aid of which this

addition might have been made. However, before his death I had sent him word that the book was so complete that no second hand ought to touch it. I have only made those small changes that must always be made whenever a book is printed. He expressly charged me to acknowledge his debt of gratitude to three of his precursors; his friend Croom Robertson, Dr. F. Tönnies, and M. Georges Lyon."

The addition of the 'few sentences' to the book might, perhaps, have made it a more satisfactory study of Hobbes than it is. Unfortunately, it contains no definite estimate of Hobbes either as a man of letters or as a philosopher. Yet both these estimates were to be expected in a contribution on Hobbes to the series to which this book belongs. A number of quotations, a cursory mention of his writings in the chapter devoted to his life, and a few scattered sentences suffice for the presentation of his literary side. A chapter might have been given to the subject, for Hobbes's literary activity was wide and varied, his style original and peculiarly strong and vivid. The following sentence, among others, shows that the possibility of a fuller treatment of this subject was not overlooked: "The man, as Robertson remarks, who began his career by translating Thucydides, and ended it by translating Homer, cannot be taken as a simple contemner of literature" (p. 66).

The impression left on the reader's mind of Hobbes as a philosopher is that he was 'a most estimable old gentleman misled by an excessive passion for logic' (p. 215). Indeed, Hobbes is not treated with the seriousness he deserves. His inconsistencies and difficulties are too often exposed as frailties of temperament, even when the same inconsistencies and difficulties appear in many of the greatest philosophical classics. Hobbes' *Leviathan* needs, no doubt, an ideal sovereign to be thoroughly successful, but Plato's *Republic* needs a similar kind of philosopher. It is difficult for Hobbes to explain why science based on definitions should be absolute while definitions are themselves arbitrary. It is equally difficult for Kant to explain why the forms of knowledge should have objective validity and yet be themselves subjective. Yet it is such difficulties as these that are made to cloud the real importance and significance of Hobbes. He is treated in general with a narrow critical and historical setting. Often contradictory estimates are given. For instance, we are told that "the *Leviathan,* once so terrible, may be taken for an intellectual fossil—a collection of erroneous assumptions and sophistries which are confuted in a paragraph or two of the student's text-books" (p. 73). Again: "In fact, Hobbes's *Leviathan* represents what is called 'the modern State'" (p. 204). And again: "As a matter of fact, Hobbes's legal doctrine came to life again in the hands of Bentham and his follower, Austin, the legal lights of the 'philosophical radicals.' Maine observes that they had scarcely anything to add to Hobbes's analysis of the meaning of law" (p. 207). All this is out of harmony with some of the opening sentences of the book: "Thomas Hobbes . . . was the most conspicuous English thinker in the whole period between Bacon and Locke, and his long career, described on the modern scale, would certainly have filled at least a couple of portly volumes. The actual accounts fill only a few pages. Yet, brief as they

are, they give perhaps as distinct an impression of the main outlines of a notable figure as could have been produced by far more elaborate detail. Hobbes himself was obviously convinced—I have reasons for hoping that his conviction was well founded—that a distant posterity would thirst for information about him" (p. 1).

The work is divided into four chapters with the titles, 'Life,' 'The World,' 'Man,' 'The State,' and is well indexed. The exposition of the philosophy follows the general lines laid down by Hobbes himself. In the chapter on 'The World,' there is a discussion of (1) his starting-point and aims, (2) logic, (3) physical science. The chapter on 'Man' is subdivided into (1) psychology, (2) theology, (3) determinism. The chapter on 'The State' deals with (1) contemporary controversies, (2) the social contract, (3) the Leviathan, (4) the moral law, (5) the spiritual power. The exposition of the last two chapters is made unduly full of difficulties by complicating it with the bearings of Hobbes's supposed religious beliefs. For these difficulties are at best the personal difficulties of the philosopher and by no means essential difficulties of this system. They do, of course, throw light on the opposition of Hobbes's contemporaries.

The life is well written and as complete as possible in view of our meager knowledge of the facts. One does not find, however, the statement that the circumstances revealed by Hobbes's biography have an important bearing upon an appreciation of his philosophy (p. 70), very thoroughly worked out. Much emphasis is put on his admiration of geometry and on an early conversation on the importance of motion in a theory of sensation (p. 18). In those days it was hardly a mark of distinction for a philosopher to admire geometry, and the conversation can hardly be reckoned among the 'circumstances of his life.' The bearing of contemporaneous political events on the peculiarities of his political theories is, however, well worked out. Much is made of the timidity of Hobbes. He was, indeed, very timid, but it is questionable if he deserved this thrust: "A man may refuse to serve as a soldier, at least if he can offer a substitute. 'And,' he adds, 'there is allowance to be made for natural timorousness, not only to women, of whom no such dangerous duty is expected, but also to men of feminine courage' (they may have been born in 1588)" (p. 195). The fact that some courage was needed to write and publish a book like the *Leviathan* is not noted by way of contrast. Yet the book was, naturally, the reason for timidity. Very few people, not even a Galileo or a Spinoza, were eager for martyrdom in those days. Well written and complete as the life is, one will profit by reading Aubrey and Robertson in connection with it.

The general statement of Hobbes's philosophy appears to be free from error. It is the emphasis on unessentials, on personal peculiarities and on common difficulties and inconsistencies already noted, which makes the treatment so decidedly unsatisfactory. With these given their proper place, a very clear statement of the general principles and implications of the philosophy is to be found. Considerable space is properly given to Hobbes's theory of knowledge. Here we find the same insistence on geometrical method which we find in Descartes and Spinoza, and which is

crystallized in Hobbes's terse statement: 'The only way to know is by definition.' The theory is criticised acutely, but so much is made of the doctrine that definitions are 'arbitrary,' that one needs to be reminded that Hobbes insisted not only on the arbitrary and accepted character of definitions, but also on the conditional character of science. For instance, little reference is made to such important statements as this: "There are of KNOWLEDGE two kinds; whereof one is *knowledge of facts;* the other *knowledge of the consequence of one affirmation to another.* The former is nothing else but sense and memory, and is *absolute knowledge;* as when we see a fact doing, or remember it done; and this is the knowledge required in a witness. The latter is called *science;* and this is *conditional;* as when we know, that, *if the figure shown be a circle, then any straight line through the center shall divide it into two equal parts.* And this is the knowledge required in a philosopher; that is to say, of him that pretends to reasoning."[1] Until due recognition is given to such explicit statements, we can have no adequate idea of what Hobbes meant by calling science at the same time absolute. Indeed, it is just here that we find the source of his dogmatism. He thought it useless to attempt to frame a universal conclusion from premises with different interpretations, and absurd not to accept one which was drawn from admitted definitions. He sought everywhere systematic consistency. It may be urged that he did so at the expense of the fluidity of the processes of acquisition. Yet his ideal is certainly worth serious consideration, especially in a time like ours, when this same fluidity is given as a reason for inevitable confusion in systematic thinking. Little is to be lost by emphasis on logical rigidity. It is our means of correcting our definitions.

The author points out that we owe nothing to Hobbes's physical theories. Due prominence is given to the doctrine of movement in psychology, but the similarity in aim and method in his psychology to that of recent tendencies should have been emphasized. In this respect a modern psychologist finds greater kinship with Hobbes than with Locke. His method is physiological. He did not experiment, but it is quite evident that he paved the way for profitable experimentation. In short, with him psychology was most emphatically a natural science.

The exposition of Hobbes's moral philosophy is accurate as far as it goes, but it is inadequate. The moral philosophy is easily dismissed by characterizing it as 'egoism.' It is egoism, perhaps, but this view may vary widely in the hands of different thinkers. Undoubtedly Hobbes traces all morality and all civic regulations back to the individual's hopes and fears, but he insists with unqualified emphasis that the individual, as such, affords no bases whatever for moral judgment or action. It is only in organized society that morality can exist and have meaning. There can be no obligation when the only person to whom the individual is obliged is the individual himself. Self-interest may lead to morality, but when once we have a moral law, self-surrender and obligation are imperative. Further, it is a mistake to suppose that Hobbes re-

[1] 'Leviathan,' chapter IX.

gards the individual as naturally selfish in any other sense than that his acts are the natural expressions of his individual character. Individuals, as he conceived them, differ widely in 'manners,' or character. They can attain their appropriate satisfaction only by realizing, as far as possible, their natural tendencies. They may be as 'unselfish' as the most ardent altruist could wish. So, too, an individual may be moved by sympathy, but Hobbes insists that he is not so moved unless he is naturally sympathetic. It is quite evident that the author of this book, in dealing with these questions, would have done well to have borne more effectively in mind Hobbes's doctrine that 'the only way to know is by definition,' for the definitions of the author and the philosopher are far from being the same on these controverted points. It is true that Hobbes's estimate of the 'natural man' is not high, but he is by no means unique in that. On the other hand, he estimates the civic and moral man as responsible for all the benefits and glories of civilization.

The author is undoubtedly correct in pointing out that the majority of moral philosophers do not accept Hobbes's identification of the moral and the civil law, although here, again, the importance of definition is not to be overlooked. Hobbes aimed at a moral philosophy which should be definite and positive. It becomes, thus, in his hands, simply the morality of positive law. Where there is no law, there is no transgression and no obedience; and no law is binding unless one is really bound to it. Hobbes could not conceive that a person is morally bound to do a thing which he could leave undone without incurring punishment from some one who had the acknowledged right and power to inflict it. He would find the definition of obligation as 'the binding force of an ideal' quite meaningless when judged in the light of moral practice and ascertainable and unequivocal obligation. Nothing can bind unless it is commanded, and no man can, in strictness, command himself. In all this, Hobbes, as the author points out, is careless of the richness of the moral life as it is to-day conceived by many. Yet Hobbes's moral philosophy remains one of the strongest pleas for positive morality, an unflinching insistence on respect for law as such, a vigorous protest against the doctrine that the individual's obedience to positive law is to be construed in the light of his liking for it and not in the light of the power which can enforce it. This may be an inadequate doctrine, but it is not simply the logic of an 'estimable old gentleman.' It may sound brutal and do injustice to the finer moral feelings, but it is most wholesome. It may make no account of the unwritten laws of public opinion, but it has the merit of being definite. It may be presented with too great confidence that it has been demonstrated, but it is far from being absurd. Indeed, ethics to-day would profit much more by a renewed analysis of moral action in the light of positive law than by continuing to discuss the rival claims of intuitionism and utilitarianism.

The author's analysis of Hobbes's distinctly political theories in their application to practical government and historical practice is the most satisfactory portion of the book. The limitations under which Hobbes labored through ignorance of the history of the growth of institutions and

through the pressing controversies of his own day, are clearly exhibited. Two quotations may serve to bring this out. "Hobbes . . . is not arguing for one form of government more than for another. He prefers monarchy; but his special point is that in every form, monarchistic, aristocratic, or democratic, there must be a 'sovereign'—an ultimate, supreme, and single authority. Men, he says, admit the claim of a popular State to 'absolute dominion,' but object to the claim of a king, though he has the same power and is not more likely, for reasons given, to abuse it. The doctrine which he really opposes is that of a 'mixed government'" (p. 198). "Hobbes's dislike to popular rule may be due in part to a certain intellectual difficulty. A sovereign must needs be a unit. But Hobbes is not comfortable with abstractions, or with so vague a body as the sovereign in a complex political system. He likes to have a king—a concrete, tangible individual in whom his principles may be incarnated. This prevents him from recognizing one development of his theory which none the less was implied from the first. He perceives with perfect clearness and asserts in the most vigorous way that the division of sovereignty was the real weakness of the English system. His prejudices lead him to throw the whole blame upon the popular leaders. But a man of science should see that it is little to the purpose to blame individuals. Their discontent is a fact: a philosophical reformer should aim not at denouncing the symptoms, but at removing the causes of discord. It was clearly hopeless to persuade either side that it was in the wrong; but he might have tried to give an impartial diagnosis of the disease. He might then have admitted that the true solution might be, not to give the power of the purse to the king, but to give the power of the sword to the parliament. If he had contemplated that proposition, he might have foreseen (I do not mean that any human being could wholly have foreseen) that his theory would apply to a radically changed order" (p. 203).

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An Examination of the Rationalistic Attitude. GUSTAV SPILLER. *The International Journal of Ethics,* July, 1904. Pp. 488–496.

The average rationalist is so impressed by the evils of superstition that he decries emotion and will, forgetting that his own appeal in behalf of reason is evidently directed to the emotions of his hearers. Reason itself arises only to meet the demands of our complex practical needs and must be at all times the instrument of these. The love of reason is only one of the many justifiable passions of the soul. The rationalist is usually concrete and negative, advocating, not the pure love of reason in all its manifestations, but the abolition of unreason as embodied in some supernatural religious system, forgetting that the destruction of this but leaves the field open to the host of equally objectionable naturalistic quacks and medicine-men. When 'it is no more the gods who are believed to protect us, it is an endless number of systems of diet, exercise and what not.' Moreover, life is far too complex to permit of action based only upon rationally

proved certainties. Indeed, the very creation of our rational systems is a matter of subjective selection and interest. "We may agree consequently that the Pragmatist and the defender of Faith are justified in so far as they insist that one may reasonably revere other things than knowledge, . . . and the Rationalist will be justified in so far as he contends that life's complexity and the diversity of men's wants make it imperative that the reason shall be called in to investigate and to decide upon the many diverging claims put forward."

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JOURNALS AND NEW BOOKS

THE PHILOSOPHICAL REVIEW. September, 1904. Vol XIII., No. 5. *The Infinite New and Old* (pp. 497–513): J. A. LEIGHTON. – Royce Dedekind Russell and Cantor are wrong in thinking that the infinite defined as a completely self-representative system is any less potential than the infinite defined as a quantity greater than any assignable quantity. There is no demonstration of the actuality of either the old or new infinite. The infinite may indeed exist as the positive and individual limit of the various indefinitely continuable series of experience which, however, in themselves only prove that there is a certain element of self-transcendency in our consciousness. *On the Categories of Aristotle* (pp. 514–528): ISAAC HUSIK. – The author cites numerous passages from Aristotle's works as evidence for the conclusion that "the treatise of the Categories is closely related to that of the Topics, . . . that it was written before the latter and serves as a basis for it upon which it builds, very often going beyond the Categories. This applies to the first nine chapters properly called Categories in the same measure as to the *Postpraedicamenta* . . . *Ergo,* the whole work is genuine, and its peculiar character is to be explained on the ground of its being one of the earliest attempts of Aristotle." *Proceedings of the Fourth Annual Meeting of the Western Philosophical Association* (pp. 529–540): ARTHUR O. LOVEJOY, SECRETARY. – To the secretary's account of the generally successful nature of the meeting are appended abstracts of the papers presented by Messrs. Ogden, Hinman, Ellwood, Lloyd, Stuart, Lovejoy and Johnson. Discussions: *The physical and the Psychical* (pp. 541–546): H. HEATH BAWDEN. – The author defends his theory of the psychical against the charges of inconsistency and ambiguity brought by Miss Andrus in the preceding number of the *Philosophical Review.* *Professor Bakewell on the Ego* (pp. 546–552): C. A. STRONG. – The author here discusses Professor Bakewell's criticism (published in the preceding number of the *Philosophical Review*) of his view of the Ego and adduces further reasons in support of that view. *Professor Strong on the Passing Thought* (pp. 552–559): C. M. BAKEWELL. – The author defends his previous contention that Professor Strong's view of the Ego is abstract and inadequate. Reviews of Books: Alfred Russell Wallace,

Man's Place in the Universe: JOHN GRIER HIBBEN. A. Donner, *Grundriss der Religionsphilosophie:* E. RITCHIE. John Theodore Merz, *A History of European Thought in the Nineteenth Century, Vol. II.:* A. C. ARMSTRONG. Armand Sabatier, *Philosophie de l'effort:* A. W. MOORE. Summaries of Articles. Notices of New Books. Notes.

REVUE PHILOSOPHIQUE. September, 1904. *De l'Expression de l'Idée de Sexualité dans le Langage* (pp. 225–246): R. DE LA GRASSERIE. The sex-idea appears late in grammar. Gender at first refers to the distinction of living and non-living. Only when the sex-relations become important, as in monogamy, does gender refer to male and female. These two are artificially applied later to things which resemble male or female qualities. Neuter is to feminine as feminine is to masculine. *Ce qu' enseigne une Oeuvre d'Art* (pp. 247–269): P. GAULTIER. – A work of art is distinguished by its style, and its value is that it shows the personality of the artist and the spirit of his time. The subject is the most important factor. *La Sur-Action* (pp. 270–279): M. DAIREAUX. – Apparently abnormal or superhuman action in times of moral transition occurs in three types: simple abnormal action, subjective action without apparent movement, and vivid representation of the action. *Observations et Documents* (pp. 280–284): F. CLÉMENT. – Nietzsche's extraordinary imaginative power in *Thus spake Zarethoustra* was the effect of long unconscious incubation. *Analyses et Comptes Rendus.* Mach, *La Mécanique, 4e edition trad.*: A. REY. G. Berguer, *L'Application de la Méthode scientifique à la Théologie*: F. PILLON. M. Wartenburg, *Das idealistische Argument in der Kritik des Materialismus*: C. BOS. M. de Wulf, *Introduction à la Philosophie Néoscolastique*: P. ALPHANDERY. P. Grimanelli, *La Crise morale et la Positivisme*: FR. P. P. Shorey, *The Unity of Plato's Thought*: CH. HUIT. Th. Valentiner, *Kant und die Platonische Philosophie*: CH. HUIT. J. F. Nourisson, *Rousseau et la Rousseauisme*: F. PILLON. A. Eymin, *Médecins et Philosophes*: CH. BLONDEL. L. Figard, *Un Médecin Philosophe au XVIe siécle*: P. C. E. Troile, *La Dottrina della Conoscenza nei moderni precursori di Kant*: J. SEGOND. B. Erdmann, *Historische Untersuchungen ueber Kant's Prolegomena*: J. SEGOND. J. T. Merz, *History of European Thought in the 19th Century* (Vol. II.): G. M. R. Adamson, *The Development of Modern Philosophy*: A. PENJON. W. Wundt, *Gustav Theodor Fechner*: FOUCAULT. Revue des Périodiques Étrangers. Livres deposés.

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NOTES AND NEWS

THE Section of Anthropology and Psychology of the New York Academy of Sciences met in conjunction with the New York Branch of the American Psychological Association, on Monday, October 24, at the American Museum of Natural History, in New York. The following papers were read and discussed:—'The Correlation between Motor-Strength, Quickness and Accuracy': Dr. R. S. Woodworth. 'Some Problems of the Fringe of Consciousness': Dr. Irving King. 'A Comparison of the Mental and Physical Resemblances of Twins': Professor E. L. Thorndike. 'The Nature of Consciousness': Professor F. J. E. Woodbridge.

THE lectures given by Professor de Vries at the University of California, during the summer of 1904, are being edited by Dr. D. T. MacDougal and will be published by the Open Court Publishing Co., of Chicago, in January, in a volume entitled 'Species and Varieties; their Origin and Mutation.'

PRINCIPAL C. LLOYD MORGAN, of the University College, Bristol, England, addressed the Psychological Journal Club of Columbia University on November 4.

FOSTER P. BOSWELL, Ph.D. (Harvard, 1904), has been appointed assistant in psychology; and Edwin Lee Norton, instructor in philosophy, in the University of Wisconsin.